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EXAMINER

WANG, QUAN ZHEN

ART UNIT PAPER NUMBER

2633

DATE MAILED: 02/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/976,290

Applicant(s)

PROHASKA, JOHN

Examiner

Quan-Zhen Wang

Art Unit

2633

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 January 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 January 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Applicant's amendments to fig. 7 filed on January 5, 2006 has been entered.

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, "a pair of orthogonal single-axis mirror actuators" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 8 and 15 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claims 8 and 15 recite the limitation "a pair of orthogonal single axis mirror actuators". However, the specification does not describe the recited limitation in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1, and 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Henry et al. (U.S. Patent US 6,035,080) in view of admitted prior art figs. 4A and 4B and lines 8-27 on page 3 (APA).

Regarding claim 1, Henry teaches a re-configurable wavelength selective device (fig. 6) comprising an input fiber (fig. 6, IN), where a signal comprising multiple wavelengths is brought into the device, a cross-connect switch (fig. 6, 1XN switch 60), two output fibers, one for a selected wavelength λ_i (fig. 6, DROP) and the other for the remaining wavelengths which pass through the device unaffected (fig. 6, OUT). The system of Henry differs from the claimed invention in that Henry does not specifically teach that the cross-connect switch includes a plurality of input fibers and an array of micro-mirror actuators. However, it is well known in the art that an array of micro mirrors can be used for a cross-connect. For example, APA pointed out that "MEMS actuated micro-mirrors offer an inexpensive, versatile way to redirect light beams in optical systems" (page 3, lines 8-9). APA further pointed out that "micro-mirrors may be readily formed into small to large arrays using a wide array micromachining techniques" (page 3, lines 13-14). APA further pointed out that "MEMS devices have been used ... as wavelength selective switches" (page 3, lines 18-19). Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a micro-mirror based cross-connect switch including a plurality of input ports, as it is disclosed by APA, into the system of Henry in order to redirect light beams in an inexpensive, versatile way.

Regarding claims 3-4, Henry further teaches that the system further comprising an optical circulator (fig. 6, circulator 50), and the selected wavelength is output from the optical circulator (fig. 6, DROP).

Regarding claim 5, Henry further teaches that the cross-connect switch further comprises a plurality of output fibers that each includes a fiber Bragg grating (fig. 6, A1 – An).

Regarding claim 6, Henry further teaches that the cross-connect switch comprises an array of output fibers (fig. 6, A1-An). It is inherent that for a micro-mirror based cross-connect switch, a signal received at any of the input port fibers may be output via any one of the outputs.

6. Claims 9-14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson et al. (U.S. Patent US 6,768,822 B1) in view of admitted prior art figs. 4A and 4B and lines 8-27 on page 3 (APA).

Regarding claim 9, Robinson teaches a reconfigurable dispersion compensation device (fig. 1), comprising: an input fiber (fig. 1, input fiber 7) including a corrupted signal (fig. 1, light in); and a cross-connected switch that receives the corrupted signal and directs the corrupted signal to one of a plurality dispersion compensation gratings (fig. 1, Q1-Q5) for imparting a compensating dispersion to the corrupted signal (column 3, lines 41-67), and an output (fig. 1, output 8) for providing a compensated signal (fig. 1, light out). The system of Robinson differs from the claimed invention in that Robinson does not specifically teach that the connect switch further comprising an array of micro-mirror actuators. However, it is well known in the art that an array of micro mirrors can be used for a cross-connect. For example, APA pointed out that “MEMS actuated micro-mirrors offer an inexpensive, versatile way to redirect light beams in optical systems” (page 3, lines 8-9). APA further pointed out that “micro-

mirrors may be readily formed into small to large arrays using a wide array micromachining techniques" (page 3, lines 13-14). APA further pointed out that "MEMS devices have been used ... as wavelength selective switches" (page 3, lines 18-19). Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a micro-mirror based cross-connect switch, as it is disclosed by APA, into the system of Robinson in order to redirect light beams in an inexpensive, versatile way.

Regarding claims 10 and 14, Robinson further teaches that the system further comprising a circulator (fig. 1, circulator 2) for receiving the corrupted signal and for output the compensated signal, and the compensated signal is passed through the circulator and to the output fiber (fig. 1, output fiber 8).

Regarding claim 11-12, Robinson further teaches that the dispersion compensation gratings are fiber Bragg gratings with unique period variations (column3, lines 41-67).

Regarding claim 13, APA further discloses that the micro-mirror actuator further comprises a pair of orthogonal single axis mirror actuator (page 3, lines 8-27).

7. Claims 2 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Henry et al. (U.S. Patent US 6,035,080) in view of Gloeckner et al. (U.S. Patent US 6,445,841 B1) and further in view of Fritz et al. (U.S. Patent US 5,446,809).

Regarding claim 2, Henry teaches a reconfigurable wavelength selective device comprising an optical circulator (fig. 6, circulators 50), having a first port, a second port

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and a third port, wherein, inherently, light entering the first port exits the second port, light entering the second port exits the third port, and light entering the third port exists the first port; a plurality of fiber Bragg gratings (FBGs) configured to provide narrow band spectral filtering by retro-reflecting the Bragg wavelength (fig. 6, Bragg gratings A1-An). Henry differs from the claimed invention in that Henry does not specifically teach to use a MEMS cross-connect switch, comprising a plurality of input port fibers, at least one array of micro-minor actuators, and an array of output fibers, said cross-connect switch configured so that an optical signal received from any one of the input fibers may be directed to any one of the output fibers via the micro-mirror array.

However, it is well known in the art to use a MEMS cross-connect switch. For example, Gloeckner discloses a MEMS cross-connect switch (fig. 9), comprising a plurality of input port fibers (fig. 9, input fibers), at least one array of micro-minor actuators (fig. 9, MEMS micro-mirrors), and an array of output fibers (fig. 9, output fibers), said cross-connect switch configured so that an optical signal received from any one of the input fibers may be directed to any one of the output fibers via the micro-mirror array (column 10, lines 35-61). Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a MEMS cross-connect switch, as one taught by Gloeckner, into the system of Henry to replace the 1xN switch of 60 in order to increase the flexibility of wavelength selective device. The modified system of Henry and Gloeckner further differs from the claimed invention in that Henry and Gloeckner do not specifically teach to use a fiber optic coupler configured to combine all of the cross-connect switch output branches so that unselected wavelength

channels exit the re-configurable wavelength drop through a single fiber port. However, the unselected wavelength channels do exit the re-configurable wavelength drop through a single fiber port in modified system of Henry and Gloeckner (Henry; fig. 6, output port of circulator 51). In addition, a fiber optic coupler is well known in the art. For example, Fritz discloses a Nx1 coupler (fig. 7) to couple N optical fibers into a single optical fiber. Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a Nx1 fiber optical coupler, as it is taught by Fritz, into the modified system of Henry and Gloeckner, and configure the coupler to combine all of the cross-connect switch output branches so that unselected wavelength channels exit the re-configurable wavelength selective device through a single fiber port in order to simplify the modified wavelength selective device.

Regarding claim 16, the Fiber Bragg Gratings of Henry includes unique period variations.

8. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Henry et al. (U.S. Patent US 6,035,080) in view of admitted prior art figs. 4A and 4B and lines 8-27 on page 3 (APA) and further in view of Fritz et al. (U.S. Patent US 5,446,809).

Regarding claim 7, the modified system of Henry and APA differs from the claimed invention in that Henry and APA do not specifically teach that the system further comprising a fiber optical coupler configured to combine branches outputted from the cross-connect switch so that unselected wavelength channels exit through the other of the two output fibers. However, it is well known in the art to use a fiber optic coupler to combine a plurality of optical fibers to one output fiber. For example, Fritz

teaches an optical coupler (fig. 5) to combine 16 fibers into one output fiber. Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a fiber optic coupler, such as the one taught by Fritz, into the modified system of Henry and APA in order to combine the plurality of outputs of the cross-connect switch into one output fiber.

9. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Henry et al. (U.S. Patent US 6,035,080) in view of admitted prior art figs. 4A and 4B and lines 8-27 on page 3 (APA) and further in view of Solgaard et al. (U.S. Patent US 6,097,859).

Regarding claim 8, as it is understood in view of the above 112 problem, the APA figs 4A and 4B further teaches single axis mirror actuators. The modified system of Henry and APA differs from the claimed invention in that Henry and APA do not specifically teach that the micro-mirror actuators further comprise a pair of orthogonal mirror actuators. However, it is well known in the art to use a pair of orthogonal micro-mirror actuators for a cross-connect switch. For example, Solgaard teaches to use a pair of orthogonal micro-mirror actuators (fig. 2, micro-mirrors 46a and 46e) for a cross-connect switch. Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a pair of orthogonal micro-mirror actuators, as it is disclosed by Solgaard, into the modified system of Henry and APA in order to selectively switch the input optical signal to desired output port.

10. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Henry et al. (U.S. Patent US 6,035,080) in view of Gloeckner et al. (U.S. Patent US 6,445,841

B1), Fritz et al. (U.S. Patent US 5,446,809), and admitted prior art figs. 4A and 4B and lines 8-27 on page 3 (APA) and further in view of Solgaard et al. (U.S. Patent US 6,097,859).

Regarding claim 15, as it is understood in view of the above 112 problem, the modified system of Henry, Gloeckner, and Fritz differs from the claimed invention in that Henry, Gloeckner, and Fritz do not specifically teach that the micro-mirror actuators are single axis micro-mirrors. However, single axis micro-mirrors are well known in the art, as it is admitted by the applicants in the prior art figs. 4A and 4B. Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate the prior art single axis micro-mirrors into the modified system of Henry, Gloeckner, and Fritz in order to "offer an inexpensive, versatile way to redirect light beams in optical systems". The modified system of Henry, Gloeckner, Fritz, and APA further differs from the claimed invention in that Henry, Gloeckner, Fritz, and APA do not specifically teach that the micro-mirror actuators further comprise a pair of orthogonal mirror actuators. However, it is well known in the art to use a pair of orthogonal micro-mirror actuators for a cross-connect switch. For example, Solgaard teaches to use a pair of orthogonal micro-mirror actuators (fig. 2, micro-mirrors 46a and 46e) for a cross-connect switch. Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a pair of orthogonal micro-mirror actuators, as it is disclosed by Solgaard, into the modified system of Henry and APA in order to selectively switch the input optical signal to desired output port.

Response to Amendment

11. Applicant's arguments filed on January 5, 2006 have been fully considered but they are not persuasive.

Regarding the claimed feature of "a pair of orthogonal single-axis mirror actuators", the Applicant argues that submitting "a corrected drawing sheet illustrating this feature is not required under 37 C.F.R. 1.83(a)". The Examiner disagrees with the Applicant. As it is set forth by 37 C.F.R. 1.81(a), "The applicant for a patent is required to furnish a drawing of his or her invention where necessary for the understanding of the subject matter sought to be patented." For the instant case, there are unlimited number of configurations for "a pair of orthogonal single-axis mirror actuators". Without clearly disclosing how the claimed "a pair of orthogonal single-axis mirror actuators" are configured, it would be impossible for one of ordinary skill in the art at the time when the invention was made to be able to make and/or use the claimed invention. Therefore, the objection of the drawings still stands. For the same reasons, the rejection of claims 8 and 15 under 35 U.S.C. 112 first paragraph still stands.

Regarding claims 1 and 3-6, the APA pointed out that "MEMS actuated micro-mirrors offer an inexpensive, versatile way to redirect light beams in optical systems" (page 3, lines 8-9). APA further pointed out that "micro-mirrors may be readily formed into small to large arrays using a wide array micromachining techniques" (page 3, lines 13-14). APA further pointed out that "MEMS devices have been used ... as wavelength selective switches" (page 3, lines 18-19). It is well known in the art that when arrays of

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micro-mirrors are used for an optical switch, the switch inherently has a plurality of input ports and output ports. For example, Wang (U.S. Patent US 6,366,715 B1) discloses a micro-mirrors array based optical switch (fig. 1) having a plurality of input ports (fig. 1, input fibers 110) and output ports (fig. 1, output fibers 140); Huibers et al. (U.S. Patent US 6,337,760 B1) disclose a micro-mirrors array (fig. 1, micro-mirrors 104 and 106) based optical switch having a plurality of input ports (fig. 1, input fibers 100) and output ports (fig. 1, output fibers 102). For yet another example, Peeters et al. (U.S. Patent US 6,300,665 B1) teach a micro-mirrors array (fig. 2a, micro-mirrors 105 and 106) based optical switch having a plurality of input ports and output ports. By no means the Examiner meant the prior art discloses MEMS device having been used in the prior art as wavelength selective switches. However, the cited APA clearly shows that one skilled in the art would be motivated to combine a micro-mirror array based optical switch with the wavelength selective portion of Henry to form a wavelength selective device using micro-mirrors. The combination of a well-known optical micro-mirror switch with the wavelength selective portion of Henry clearly discloses all the claimed limitations and the rejections to claims 1 and 3-6 still stand.

Regarding claims 9-14, the Applicant argues that "... Robinson merely relates to chromatic dispersion device. There does not appear to be any suggestion in Robinson that the input signal may include a corrupted signal. ..." However, any one of ordinary skill in the art would know that chromatic dispersion is one of many kinds of signal corruptions. For example, Fortenberry (U.S. Patent US 6,088,088) points out in the Background of The Invention that "chromatic dispersion causes frequency-dependent

group delay variations that limit data rates and corrupt transmission of optical signals within optical communication systems" (column 1, lines 6-9). In addition, as it is pointed out above regarding claims 1 and 3-6, "a cross-connect switch comprising an array of micro-mirror actuator" is indeed well known in the art. The combination of the cited references clearly discloses all the claimed limitations and therefore, therefore, the rejections to claims 9-14 still stand.

For the same reasons stated above, the rejections to claims 2 and 16 also stand.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Riza (U.S. Patent US 6,525,863 B1) discloses a multi-technology multi-beam-former platform for robust fiber-optic beam control modules.

13. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quan-Zhen Wang whose telephone number is (571) 272-3114. The examiner can normally be reached on 9:00 AM - 5:00 PM, Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

qzw
8/18/05


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